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## THE RECENT PRODUCTION OF SILVER AND ITS PROBABLE FUTURE.

Since 1890 silver has suffered a marked decline in value, amounting at its maximum to 25.9 per cent as compared with the entire group of metals, and 44 per cent as compared with gold. We should expect such a fall in value to be reflected in a decreased production, but this does not appear to have been its result. The following table gives the total silver product and the product of the chief sources of supply:

YEAR.	Total Prod. Oz.	United States. Oz.	Mexico. Oz.	Australia, Peru, Bolivia, Chile. Oz.
1893 . . . . .	165,472,621	59,999,956	44,362,519	39,166,416
1894 . . . . .	164,610,394	49,500,500	47,038,381	46,160,683
1895 . . . . .	168,308,353	55,726,945	46,962,738	49,146,615
1896 . . . . .	165,100,887	58,488,810	47,985,914	37,446,005
1897 . . . . .	177,352,836	56,457,292	54,052,647	38,746,408

The apparent lack of correspondence between the production and the value of silver has been cited as evidence that the margin of cost of production has not yet been reached; that silver is so abundant that no matter what its price, the supply will be sustained. A study of the conditions of silver production will not support this conclusion.

Silver is found in two forms: in "straight" or free milling ores, from which the silver can be extracted by mercury amalgamation, and in which silver is the only constituent of any value, and secondly, in connection with several other metals, notably with copper and lead. Silver is, therefore, a co-product with these metals, and its production is influenced by the state of the lead and copper supply. Conversely the production of lead and copper is

affected to some extent by the production of silver. Professor Austin, the chemist of the Royal Mint, presented to the Royal Gold and Silver Commission of 1888 the following classification of silver product of the year 1883:

Manner of Occurrence.	Ounces.
Silver found in connection with gold . . .	508,000
Lead-silver ores . . . . .	30,726,000
Copper-silver ores . . . . .	7,200,000
"Straight" silver ores . . . . .	49,920,733
	<hr/> 88,354,733

In 1891 the Director of the Mint made a classification for the production of the United States:

	Ounces.
Quartz and milling ores ("straight" silver) and gold ores . . . . .	28,625,000
Lead-silver ores . . . . .	23,707,000
Copper-silver ores . . . . .	5,998,000
	<hr/> 58,330,000

In these estimates silver produced from quartz and free milling ores, that is from ores whose principal mineral content is gold and silver, comprised much the greater part of the total production. We should be led to expect that the course of silver production would mainly depend on the value of silver and that it would be but slightly influenced by circumstances affecting lead and copper production. Such was indeed the case during the increase of silver production from 1889 to 1892. At this period the prices of lead and copper ruled very low and the production of these metals tended to decline. The production of copper from the Anaconda mines, the greatest copper-silver producer, was in 1888, 63,245,473 pounds; 1889, 61,647,000; 1890, 64,046,812; 1891, 46,500,000. The production of lead in Colorado in 1888 was 65,000 tons; 1889, 69,000; 1890, 54,500; 1891, 64,000; in Idaho, in 1888, 30,000; 1889, 32,500; 1890, 33,000, and in 1891, 40,000. Imports of silver-lead from Mexico also decreased from 28,626 tons in

1888 to 23,867 in 1891, but this was partially due to the McKinley tariff.\* The silver production of the United States during this period increased from 1,424,326 kilograms in 1889 to 1,814,642 kilograms in 1891, and it is plain that this increase came from "straight" silver ores. A like increase occurred in most of the other silver producing countries whose product was mainly derived from "straight" ores. Before 1893, therefore, the production of silver was governed by the value of silver and was but little influenced by the production of lead and copper. Since 1893 this condition has been reversed.

The immediate result of the action of the Indian Government was to paralyze the silver-producing industry of the west. At a meeting of silver miners and smelters held in Denver, June 29, 1893, it was decided to suspend operations in all the important mines of the west, and most of the principal mines and smelting works of Colorado, Nevada, Montana, Utah, and Idaho were immediately shut down.†

Although some of these mines were later reopened, most of them remain closed at the present time. Thousands of silver mines which were profitable under former conditions are now closed, and the depression shows no signs of improvement so long as silver remains at its present value.‡ This depression extended to Mexico and South America, and also to Australia.§

We should expect this depression in silver production to exert a marked influence upon the output, but the following

\* "Rothwell Mineral Industries," 1892, pages 310 and 312.

† "Engineering Mining Journal," Vol. lvi, page 4. "The principal mines closed at this time were: Moffats mines at Leadville, Creede, Rico, Cripple Creek, and other points; the Holden Smelting Works at Leadville, and the Lixiavation plant at Aspen, the Mollie Gibson and Smuggler mines. In Montana almost every silver mine was closed. In Utah and Nevada, the Diamond, Daly West, Jordan, Galena, Bullion Beck, Crescent, Anchor and Yosemite.

‡ "Western Mining World," July 2, 1898.

§ "Engineering and Mining Journal," Vol. lvi, page 441; "Western Mining World," July 24, 1897; "Engineering Magazine," Vol. vii, page 182 ff. Silver mining in Bolivia and Peru cannot be developed much farther owing to the low price silver.

table shows very conclusively that the production of silver has not materially decreased:

*World's Production of Silver, 1893-97, in Fine Ounces.*

COUNTRIES.	1893.	1894.	1895.	1896.	1897.
Mexico . . .	44,362,519	47,038,381	46,962,738	47,985,914	54,052,647
Canada . .	248,583	847,687	1,775,658	3,205,343	5,538,446
Peru . . . .	1,904,744	3,236,759	3,162,973	2,267,525	1,876,590
Bolivia . . .	13,631,449	21,999,966	28,444,400	11,500,000	10,500,000
Chile . . . .	3,128,709	2,850,503	5,031,907	4,870,725	4,870,725
Australia . .	20,501,508	18,073,455	12,507,335	21,216,534	16,078,604
United States	59,999,956	49,500,500	55,726,945	58,835,000	53,860,000
Arizona . .	2,985,700	1,147,204	859,739	2,000,000	1,332,292
California .	470,100	717,368	463,739	600,000	757,300
Colorado . .	26,000,000	23,281,399	17,891,626	22,500,000	21,278,202
Montana . .	17,000,000	12,820,081	15,046,409	15,720,000	16,807,346
Idaho . . . .	3,910,700	3,288,548	3,425,653	5,400,000	6,000,000
New Mexico	458,400	632,183	409,549	700,000	350,000
Nevada . . .	1,700,000	1,035,151	807,230	11,200,000	1,500,000
Utah . . . .	7,252,600	5,891,901	6,579,043	8,842,810	6,689,754
Texas . . . .	140,400	429,314	529,974	525,400	600,000
S. Dakota .	349,400	58,973	98,523	274,900	242,781

The sustained production of 1893 was the result in large measure of a general cleaning up on the part of the smelters, which exhausted their stock of ore preparatory to a shut-down. This explanation, however, will not suffice for the later years.

The fall in silver closed a large number of mines, in particular those mines which depended upon silver alone to pay expenses and dividends. The result has been to confine the production of silver to the lead and copper mines. It is impossible to state exactly the condition of copper-silver and lead-silver production. Some attempts have however been made. In the United States in 1896 the total production of silver was 58,488,000 ounces. The copper-silver mines of Butte and the lead-silver mines of Leadville with the Coeur d'Alene, produced about 20,000,000 ounces of silver. Much lead-silver ore was produced in Montana, especially in the Castle District; the Wood River

region of Idaho; in Bingham, Arizona, and the Tintic region of Nevada; in some parts of New Mexico, in Colorado, in the region around Leadville and at isolated points in the Rocky Mountains.\* Some silver is produced from gold mines proper. Crude bullion assays only \$18 an ounce by reason of its silver and copper content which is extracted in the refining process. The ores of the Comstock and of the De Lamar mines of Idaho are gold-silver, the gold content being of greater value than the silver. It is probable that only 4,000,000 ounces were produced in the United States in 1896 from "straight" silver ores. In Australia the Broken Hill silver-lead mines furnish more than one-half the output. In Mexico a large amount of silver is produced from silver-lead and silver-copper mines. Probably two-thirds of Mexico's present silver production is derived from "straight" silver ores.†

The production of South America comes mainly from "straight" ores, and small amounts are still obtained from similar sources in Austria, Germany and Spain. Fully two-thirds of the world's silver is produced in connection with other metals, and was affected not only by the demand for silver, but by the demand for copper, lead and gold. In order to understand this more thoroughly, let us take the case of the United States. We may assume that in the silver production of the United States in 1896, 34.4 per cent was produced in connection with copper; 6.8 per cent from "straight" silver ores, and the remainder, 34,000,000 ounces, or 58.8 per cent, from lead ores.‡ The production of silver will tend to respond not only to the value of silver, but to the values of lead and copper which influence the production of these metals. The production

\* "Engineering Mining Journal," September 4, 1897, Vol. lxiv, pages 271-22.

† In 1896, 28,565,843 ounces left the country in the form of base lead bullion and copper; 9,971,053 in the form of ores; and 20,941,976 was deposited for coinage which amount represents the "straight" silver.

‡ Included in this estimate is the silver produced from gold. It is relatively insignificant, and is of unknown amount. It may, therefore, be disregarded.

of silver then should not be compared with the series of index numbers which represents the value of silver, but with a series made up of the index numbers of lead, copper and silver. The index numbers are presented below. They are taken from Sauerbeck's tables:

YEA	Value of Silver.	Value of Lead.	Value of Lead and Silver.	Value of Copper.	Value of Copper and Silver.
1893 . . . . .	58.6	48	53.3	59	58.8
1894 . . . . .	47.6	47	47.3	53	50.3
1895 . . . . .	49.1	52	50.5	57	53.0
1896 . . . . .	50.5	56	53.2	63	56.7
1897 . . . . .	45.3	62	53.6	65	55.0

While the value of silver fell 22.6 per cent from 1893 to 1897, the value of lead increased 29.1 per cent and the value of copper 10.1 per cent, so that even when the falling value of silver is included with the index numbers of lead and copper, and given an equal weight with them, the net result is a slight advance in the value of lead-silver and but a small decline in the value of copper-silver. Were it possible to give to silver a weight in these averages in proportion to its contribution to the total value of the lead-silver and copper-silver production, the combined index numbers would in each case show an advance. The effect of this upon the production of the three metals appears in the following table:\*

YEAR.	U. S. production of Silver Oz.	U. S. production of Silver-Lead. Tons.	Production of Copper. Tons.	Production of Copper, Montana. Tons.
1893 . . . . .	60,000,000	130,026	183,394	81,729
1894 . . . . .	49,500,000	119,486	163,394	81,739
1895 . . . . .	55,727,000	119,057	177,881	86,950
1896 . . . . .	58,834,800	135,332	214,149	102,213
1897 . . . . .	53,860,000	144,649	227,763	105,874

\*"Rothwell Mineral Industries," 1898, pages 419 and 427.

When we consider that the movement of the value of silver bears directly only on 6.8 per cent of the total value of silver production of the United States, while the value of lead-silver and copper-silver affect respectively 58.8 per cent and 34.4 per cent of the silver production, the explanation of the failure of the production of silver to decline is apparent. Yet while the production of silver has suffered no absolute decrease, it was impossible that the great contraction of its field of production which resulted from the closing of so many silver mines would not decrease its supply relatively to the supplies of other articles whose values had not been thus affected. We have seen that the production of copper and lead has increased more rapidly than the production of silver. The same thing holds true with other commodities. From 1893 to 1897 the production of silver was approximately stationary, but during this same period the production of coal in the United States increased from 162,814,977 tons to 185,650,892 tons; that of iron from 7,124,502 tons to 8,623,127 tons; that of cotton from 7,493,000 bales to 8,157,964 bales; that of wheat from 396,131,725 bushels to 427,684,346 bushels, while the product of gold, compared with which silver has shown the greatest decline in value, increased from 1,604,840 ounces to 2,774,935 ounces.\* Owing to the peculiarities of silver production, its diminished price has not decreased its production absolutely, but has decreased it relatively to the production of other commodities.

What is the future outlook for silver? While silver remains at its present level of value its production may reasonably be expected to show a relative decline. This has been the case since 1893. This relative decline may coincide with an absolute advance in the production, but since all values tend to an equilibrium, a readjustment will probably take place in the value of silver by a relative decrease in its supply until such an equilibrium is once

\* Statistical Abstract of the United States, 1898.



more established. The increasing production of silver from 1873 to 1891 was in large measure the result of a similar readjustment. The supply was constantly increased, and by 1891 the value of silver had shown a very considerable fall, being still, however, very far above the average value level. There is no reason to doubt that had not the events of 1893 supervened, this increased production would have continued to lower the value of silver until it reached a point where the profits of silver production were approximately equal to the gains in other lines of industry. This result was anticipated by the repeal of the Sherman Act, and now it is necessary that the movement should be reversed, that the supply of silver should so decrease that an equalization of profits shall once more be effected. The silver industry is completely stagnant. Little activity is shown in prospecting and in opening new mines. The columns of the mining journals contain few references to the silver industry save when they lament its fate and plead for its resuscitation. Capital, so far as possible, has left an unprofitable industry, and investment in silver properties is at a standstill. Unusual activity persists in lead and copper mining, but it is hopeless to expect any marked increase in silver production from this quarter while the most important sources of supply are unproductive. Free milling silver ores are little worked. This depression is common to all silver-producing countries. Everywhere the industry is waiting for more favorable conditions. That these conditions will arise in the not distant future there is every reason to believe. The relative increase in the production of commodities is already working to that end. When silver has escaped from its present predicament, and not until that time, may we expect an increase in its production proportionate to the general advance in the production of all commodities.

These conclusions may be supplemented by a more interesting although probably less practical investigation,

concerning the course of silver production in the improbable event that an increased use of silver by Europe or the United States should raise its value. There is no likelihood that any proposition for an enlarged use of silver could succeed at present or for years to come, if indeed silver will ever regain its position as a money metal, nor can the present desirability of such a measure be admitted. The contest, however, is not yet finished, although its result seems decided, and the still important question of free coinage lends interest to an inquiry as to the effects of free coinage upon the production of silver.

We must start from the hypothesis that a larger monetary use of silver would raise its value. If the increased demand came from the United States, the value of silver would, without doubt, be greatly improved. If its value should not rise, its production could not increase, and all apprehensions of a "flood of silver" from any other quarter than the existing stocks of token coins might be laid to rest. A "fifty-cent dollar" and a "flood of silver" are mutually exclusive. So we must assume an increase in the value of silver if we are to discuss the question at all. Starting from this assumption, the question arises whether conditions exist which warrant the expectation of a rapid increase in the production of silver. To this an affirmative answer must be given, and the conditions may be considered in two groups as they relate (1) to the sources of supply and (2) means of production.

It is probable that the United States has been pretty thoroughly prospected for silver. The tremendous development of the silver industry before 1890 had this result. It is by no means certain that new discoveries rivaling in richness the Comstock and the Mollie Gibson mines might not occur, but the chances are decidedly against such an event. Though the United States has not been thoroughly explored, the area within which discovery might occur has been greatly contracted. Apparently this leads to the conclusion

that the sources of supply from which an increased silver product might be drawn are strictly limited. But this is not the case. It will be remembered that the fall in silver in 1893 caused the closing down of almost every mine which relied exclusively upon silver for its income. Most of these mines were active producers up to that time and their ore supplies were far from being exhausted. Their securities stood high on the mining exchanges and a great number had many years of activity still remaining.

A single example will make this plain. In November, 1897, the Ontario silver mine of Nevada announced a suspension of operations. Its ore supply was by no means exhausted. Indeed, so flattering seemed its prospects that only a short time before the company had expended \$671,000 on a drainage tunnel. Up to the end of 1896, 33,098,117 ounces of silver had been taken from this mine, and in the final year, 1,191,673 ounces. But the average price of silver was 65.19 cents and the cost 53.94 cents per ounce, a margin of profit which in the judgment of the directors was insufficient to warrant a continuance of operations. Another large mine located near-by was closed down at the same time. Only a higher value of silver can reopen these mines which, under more favorable conditions, could continue operations for years to come.\* This is typical of a thousand similar instances. It is evident that the ore supplies of the western states are yet very far from exhaustion. No doubt some difficulty might be encountered in reopening the mines. When operations cease, the lower levels fill with water and the timbers rot. Much retimbering and pumping would be necessary, but these difficulties are not insuperable. It is no more difficult to reopen a silver mine than a coal or iron mine, and yet in the latter industries long-continued suspensions are frequent. A higher value of silver would doubtless result in the reopening of many of these abandoned mines. In addition to these unexhausted

\* "Engineering and Mining Journal," Vol. lxiv, page 602, November 20, 1897.

ore supplies, there remain the chances of prospecting, both for new discoveries and in old workings. There are also immense deposits of zinc-lead, especially in Arizona, which only await a solution of the problem of the extraction of the silver which they contain.

Passing to Mexico, we find that enormous deposits of silver of all kinds have not yet been touched. In the western portion, in the region of the Sierra Madre, unlimited quantities of low-grade ores are to be found. All over Mexico, in almost every province of the republic, are found in connection with active mines numerous deposits which from one cause or another have not been worked. An American geologist of some note, and little given to overstatement, told me that the only way to talk of the silver deposits of the Sierra Madre was in terms of acres. Large amounts of zinc lead ores are found in the eastern part of the country.\*

Central and South America present great possibilities of silver production under more favorable market conditions. Immense deposits of silver ore are known to exist in Honduras, both of virgin ores and of ore reserves in the old mines of the Spaniards, which were abandoned at the beginning of the century. At one mine, the Opeleca, it is estimated that 200,000 tons of ore are on the dumps, which will yield from \$10 to \$20 per ton. Several million tons of ore are in the reserves of this mine.† The silver belt extends clear across Honduras.

A writer in the "Engineering and Mining Journal" says

\* For Mexico, see "Rothwell's Mineral Industries," 1892, page 201. "The mining industry of Mexico at the present time stands in much the same position as that of the United States fifteen years ago, when the era of railway building and the establishment of a great metallurgical industry was just dawning."

Reports of the Director of the Mint on the Production of Gold and Silver, 1891 and 1894.

Hubert Bancroft's "The Resources of Mexico."

I am, also, indebted for many of the facts regarding Mexico silver production to Dr. Farrington, Curator of the Department of Geology, Field Columbian Museum.

† "Transactions of the American Institute of Mining Engineers," Vol. xx, page 394.

of the silver deposits of South America, "The most promising field for silver mining is found in Bolivia. The wealth of this country in silver ore is beyond calculation. At the Pulacayo mine, 446 meters below the main level, the veins run twelve feet wide and 130 ounces to the ton of ore. The supplies of silver in sight at this mine are estimated at fifty million ounces. Large amounts of ore still exist at old Potosi. This mine, which at one time produced silver to the value of ten million dollars per year, was abandoned by the Spaniards at the beginning of this century, and was not reopened till 1889. It has been equipped with the best mining machinery, and a large increase is to be expected in its production. Only a small portion of the old workings have as yet been touched. Senor Jose Maria Dalenci, writing in 1851 of Bolivia, gave the number of mines abandoned as 10,000, and those in operation as 148.

"Rich deposits of silver are known to exist in Peru, which have only to a limited extent been exploited. The area covered by mineral bearing rock is enormous. A single depression was estimated by Lieutenant Herndon in 1852 as 600 yards long by 400 wide, and sixty feet deep. This is but one of the immense cavings . . . which mark at the same time the extent of the ore deposit and the amount of the precious metal it has produced. . . . Even the mud with which the wretched adobe houses of the straggling, irregular town is built is said to assay from \$5 to \$10 per ton, and the average of the ore taken out yields by the Patio process from \$20 to \$60 per ton."\*

In the provinces of Roya and Cordova, Argentine Republic, are found extensive deposits of silver.\*

In Australia, zinc-lead is very abundant and large deposits of silver ore are found in Tasmania.†

\*"Engineering and Mining Journal," Vol. lxiv, page 250.

†"Australian Mining Standard," January, 1897; Report of the German Monetary Commission, *sup cit.* Part of this material was published in the "Journal of Political Economy," Chicago, June, 1897, Vol. v, pp. 331, 335.

In addition to deposits as yet unworked, there is a store of silver in Central and South America, and Mexico, whose origin has been in part explained in discussing the ore reserves of silver mines in the United States, and which also depends upon a peculiarity of the occurrence of silver. Above the water line silver production is comparatively easy. Atmospheric action has freed the metal from sulphur and other substances whose presence greatly complicates the problem of extraction. Then, too, when the water line is reached, costly pumping machinery is required, and as the shaft goes deeper, hoisting apparatus is essential to economical working. In Mexico, until very recently, machinery for deep working has not been used to any extent and the Patio process has been universally employed. These conditions have confined the silver producer to the high-grade free milling ores which occur above the water line. A shaft is sunk for thirty to one hundred feet down to the water line. The available ore is quickly exhausted. Then another shaft is sunk and the process is continued indefinitely. No attempt is made, except in very rare cases, to go deeper.\* The silver workings of Mexico, Central and South America are dotted all over with these small shafts. Now it is evident that the amount of silver which occurs below the water line is infinitely larger than the free milling ore on the surface. Shafts have been sunk for thousands of feet without exhausting the mines, and

\*Cor. "Engineering Mining Journal," Vol. lxiii, page 579, December 19, 1896. "There are hundreds, yes thousands, of old mines located in all parts of the country that merely have the surface scratched over and were then abandoned, because the ore was too low grade for their process of milling. There are mines here that are not denounced, that exceed in value some of the dividend paying mines of the United States."

Cor. "Engineering Mining Journal," Vol. lxiii, page 579, December 19, 1896. "Up to within a few years ago the Mexican mines were worked in the crudest fashion. . . . The people merely worked as long as they could get very high grade ore and the minute the ore fell in value they stopped and went elsewhere to seek richer ore. The ore was all worked in arrastras and in crude smelting furnaces, and as only a low percentage of metal was saved and as it took so long to work a small quantity, on veining under one hundred ounces was valueless."

work has in some cases been arrested only by the unbearable heat, as for example, in the Comstock Lode. When suitable appliances are available, the miner never thinks of stopping at the water line. He knows that the ore which lies below this point is many times greater than the amount which he can secure by skimming the surface.\*

The significance of these facts for our study is unmistakable. From the discovery of America to the year 1892, 763,983,855 ounces of silver had been extracted from Mexican mines, almost all from the free milling ores. The great deposits of low-grade and refractory ores, of whose importance these outcroppings are only a token, have been scarcely touched. It is safe to affirm that the ore reserves of these countries are very much greater in value than the silver which they have already produced. Were the value of silver to be raised, these reserves could be drawn upon to a practically unlimited extent.

We have now to discuss the future extension of the various appliances and facilities which make up the second condition of an increased supply of silver. In the United States, and generally in those regions where American enterprise has gone, there is little more to be done in this

\*The following table gives some idea of the possibilities of deep mining. "Mining Industry and Review," March 8, 1897, quoting Iron Age:

<i>Country.</i>	<i>Name of Mine and Locality.</i>	<i>Feet.</i>
United States . . .	Red Jacket, Calumet and Hecla . . . . .	4,900
" " . . .	Tamarack Lake . . . . .	4,450
" " . . .	Yellow Jacket, Comstock . . . . .	3,123
Belgium . . . . .	Prodent's Colliery, Mons. . . . .	3,937
" . . . . .	Vircer's Shaft, Gilly . . . . .	3,750
Austria-Hungary .	Adelbert, Bohemia . . . . .	3,672
Great Britain . . .	Pendleton, Manchester . . . . .	3,474
" " . . .	Ashton Moss, Manchester . . . . .	3,360
Victoria . . . . .	Lanzell's, Bendigo . . . . .	3,302
" . . . . .	Lazarin's, Bendigo . . . . .	3,024
Germany . . . . .	Kaiser Wilhelm II., Hartz . . . . .	2,960
" . . . . .	Emig. Kett, Saxony . . . . .	2,620
France . . . . .	Montchain Colliery, Crinzos . . . . .	2,300
" . . . . .	Treuil Colliery, St. Etienne . . . . .	2,034
South Africa . . .	Robinson Deep, S. A. R. . . . .	1,991
" " . . .	Nourse Deep . . . . .	1,578
Norway . . . . .	Konigsberg Silver Mine . . . . .	1,900

direction. In time, the west will build more railways, and with a rise in the value of silver, the same influences which furnished to the silver-producing states their present transportation equipment would no doubt greatly increase the railway mileage. In Mexico and South America the field is, of course, much larger. Here there is greater reason to expect a steady increase in transportation facilities, because these regions have other resources than silver. Yet if silver should rise in value, this development would be much accelerated. In mechanical and metallurgical invention there is no great margin for improvement, if we may judge from the experience of the industry in the United States. The Russell process, which was finally adopted in 1887, is the only important metallurgical improvement which has been introduced since 1870, and while many mechanical inventions have improved the efficiency of mining appliances, they have effected no revolution. If the prospect of new inventions is dubious, or at least incalculable, there is still much to be done in extending the use of the more recent improvements. In the silver industry of the United States, progress has been made through the increasing utilization of old inventions. In Mexico and South America, where, until recently, silver extraction was carried on in the crudest manner, the industry may be entirely revolutionized by the application of modern methods to the tremendous supplies of ore whose extent has been pointed out. This transition will gradually be effected in any event, while if legislation should raise the value of silver, the change would come with great rapidity. The mining industry would be eager to take instant advantage of the great opportunities for profit which would lie before it in Mexico and South America. The result would be almost certainly a very remarkable increase in the supply of silver. The supply would continue to increase until the value was brought down to the general level.

In conclusion it is important to point out that with the



adoption of the silver standard, an indefinite rise of prices, or a sustained price level at only half its present height, is an utter impossibility. A steady rise of silver prices is identical with a steady fall in the value of silver, a relative decrease in the profits of silver production, and a constant discouragement to increase the output of silver. The result would be, as in all lines of production under similar influences, a relative increase of activity in other industries, and a relative increase in the supplies of other commodities until the equilibrium of value and profits was once more established. This result is inevitable. We have only to ask ourselves the question, why should men produce silver when they could make more in other lines? in order to see the absurdity of the supposition that a silver standard implies an indefinitely continued rise of prices.\* The oft-repeated assertion that free coinage by the United States means a new price level corresponding to the present value of silver is equally untenable. It has been already shown that no increase in the supply of silver could be expected unless the value of silver rose. If Europe sold such a quantity of silver to this country as to depress the value of the white metal below its present level, instead of an increased production of silver, would come additional depression leading to a decrease in the annual output. Then if there is any connection at all between the quantity of metallic money and the value of the standard, the production of commodities and the volume of business, which are always tending to increase, taken together with the decreased output

\* Professor Henry Farnam makes this mistake in the "Yale Review" for August, 1894, Vol. iii, page 215. "Now, by an alternating circulation nothing else can be meant than one which first consists of one metal and then of the other, and this implies that first one and then the other tends to fall below the conventional ratio. This is what took place in the United States as well as in France, during the operation of the bimetallic system in those countries. What, however, would be the result, if the metal which has been falling, and whose production has been increasing for the past twenty years, should keep on falling for another twenty years or, perhaps, indefinitely? How can a system alternate which stands constantly on one foot? What possible escape, in such a case, from silver monometallism?"

of silver, would gradually raise the value of silver until an equilibrium was once more established at such a level as to admit of an increased production of silver at normal profits and at approximately the same rate as in other branches of production.

We have found in this study (1) that the sustained production of silver since 1893 has been due to its connection with copper and lead, whose production has been stimulated by higher values; (2) that the ore supplies still remaining in existing mines are of great extent; (3) that in Mexico, Central and South America, and in other regions there exist great deposits of virgin silver ore; (4) that there is a considerable field for the improvement of the industry of silver production by increasing transportation facilities, and by introducing improved appliances; (5) that the supplies of silver would be greatly increased by a higher value; (6) that the adoption of a silver standard by the United States implies neither a long sustained fall in the value of the standard, nor a price level corresponding to the present value of silver.

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